

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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Federal Communications Commission
Office of the Secretary

In the Matter of

Advanced Television Systems
and Their Impact on the
Existing Television Broadcast
Service

Review of Technical and
Operational Requirements:
Part 73-E, Television Broadcast
Stations

Reevaluation of the UHF Television
Channel and Distance Separation
Requirements of Part 73 of the
Commission's Rules

MM Docket No. 87-268

COMMENTS OF HUGHES COMMUNICATIONS, INC.

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SUMMARY

HCI urges the Commission to affirm its tentative decision that frequency spectrum for delivery of ATV signals by terrestrial broadcasters should be limited to existing VHF and UHF spectrum and that spectrum above 1 GHz, including spectrum in the 12 GHz band presently allocated to DBS, should not be made available for terrestrial ATV.

HCI supports the Commission's efforts to establish bandwidth and channelization parameters for terrestrial ATV as well as the development of ATV standards in a manner which permits continued use of NTSC. Most importantly, however, HCI urges the Commission to promote interoperability of alternative ATV distribution media particularly through development of guidelines for ATV receiver technology.

HCI recommends that the Commission urge the industry to develop ATV receiver display and production standards as quickly as possible. Such standards, in combination with at least baseband receiver interfaces for alternative media, will ensure that separate video distribution technologies may develop their own best standards for ATV transmission to bring the full benefits of ATV technology to the consumer.

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COMMENTS OF HUGHES COMMUNICATIONS, INC.

Hughes Communications, Inc. ("HCI") files these comments in response to the Tentative Decision and Further Notice of Inquiry ("TD and FNOI")^{1/} issued by the Commission in the above-captioned proceeding.^{2/}

I. INTRODUCTION

HCI, through its subsidiary Hughes Communications Galaxy, Inc. ("HCG"), is a permittee in the Direct Broadcast

1/ Advanced Television Systems, Tentative Decision and Further Notice of Inquiry, FCC 88-288, released September 1, 1988.

2/ In these comments, HCI does not undertake to address all of the issues raised in the TD and FNOI, but rather discusses those issues involved in the development of terrestrial broadcast standards that are also of particular concern for satellite delivery of ATV.

Satellite ("DBS") service and the licensee of several satellites which comprise a satellite program distribution system serving cable television. HCI anticipates that advanced television ("ATV") systems will be important features of both its DBS and satellite program distribution services. Therefore, HCI has a substantial interest in the outcome of this proceeding.

HCI fully supports the Commission's efforts to promote the development of ATV in such a way that permits participation by terrestrial broadcasters while preserving flexibility for alternative ATV formats used by other distribution media. HCI fully endorses the Commission's endeavors, both in the determination of appropriate bandwidth and channelization for terrestrial ATV and the preservation of spectrum used by alternative ATV distribution media, to leave open the fullest range of options for alternative media, such as DBS, to deliver the highest possible quality signal.

HCI believes that the key to maintaining the necessary flexibility for ATV transmission is interoperability among alternative media. This can be assured through the encouragement of prompt industry establishment of appropriate standards for receiver display and production signal formats and provisions for compatible interfaces in receiver design. These steps will facilitate marketplace development of appropriate transmission standards

for alternative media and ensure that the public receives the full benefit of ATV from each distribution medium.

II. SPECTRUM ISSUES

A. Frequency Allocation

HCI fully supports the Commission's tentative decision to limit consideration of additional spectrum for delivery of ATV by terrestrial broadcasters to existing VHF and UHF frequencies. In particular, HCI emphatically agrees with the Commission's determination, set forth in the TD and FNOI at ¶¶ 76-79, that use of frequencies in the bands between 1 GHz and 13 GHz would result in serious technical problems for terrestrial broadcasters as well as severe dislocation for existing services, such as DBS, which use those frequencies.

HCI has previously commented on the technical limitations of the use of the 12 GHz band for supplemental ATV terrestrial service.^{3/} As HCI has previously stated, the use of 12 GHz would involve such complications with large numbers of transmitters, smaller service areas, increased bandwidth requirements, higher power requirements and restricted receiver design and location as to be virtually unworkable for terrestrial supplemental ATV service.

^{3/} See June 10, 1987 Comments of HCG in response to the "Petition for Notice of Inquiry" filed on February 13, 1987 by Association of Maximum Service Telecasters, Inc., and others; November 18, 1987 Comments of HCG in response to Advanced Television Systems, Notice of Inquiry, FCC 87-246, released August 20, 1987.

Most importantly, any use of the 12 GHz spectrum presently reserved for DBS in connection with ATV provided by terrestrial broadcasters would effectively preclude the development of DBS in this country. DBS systems have the potential to offer truly universal and economical high-quality video distribution. DBS can provide ATV signal delivery over the entire continental United States, including rural and underserved areas, and has the flexibility to accommodate a number of the possible ATV signal formats. Additionally, DBS can simultaneously provide service in both the NTSC and ATV formats and has the flexibility to vary the number of channels of each type of service. The Commission has tentatively decided not to disturb nascent DBS service and should reaffirm this conclusion.

B. Bandwidth and Channelization

Bandwidth requirements for ATV are addressed in the TD and FNOI at ¶¶ 40-81. It is beyond the scope of these comments to provide a thorough analysis of the alternative bandwidth and channelization plans proposed for terrestrial broadcast ATV. However, HCI does believe that the use of a 6 MHz channel is a desirable goal for terrestrial as well as alternative delivery of ATV, and should be pursued vigorously. This channel bandwidth strikes a good balance between the need for additional use of scarce spectrum and the desire for wider bandwidth to ensure signal quality. However, it is not clear that a single 6 MHz channel will be

able to both provide HDTV quality and satisfy NTSC compatibility requirements.

Considering the existing investment in NTSC receivers, NTSC production and transmission facilities and programming, HCI believes that compatibility with NTSC is important. New ATV services, at least for a transition period, will require such compatibility in order to be viable and to avoid loss in service to the consumer. To the extent that full compatibility is not achievable, providers of satellite delivered ATV will be concerned with the impact that the additional expense of conversion between NTSC and ATV will have on the cost of receivers.

To a large extent, the total bandwidth required for terrestrial ATV does not significantly affect satellite delivery of ATV signals. Satellite delivery systems will be capable of delivering 6, 9, or 12 MHz baseband ATV signals. As discussed in the TD and FNOI at ¶¶ 97-102, with no significant changes in the current space segment or ground segment, it is expected that 36 MHz transponders, typical on C band satellites, could provide distribution of 6 and 9 MHz baseband ATV signals. The 12 MHz baseband ATV signals, which generally are composed of two 6 MHz baseband signals, also could be delivered using two 36 MHz transponders on a C band satellite or one 54 MHz transponder on a Ku band satellite.^{4/}

4/ The exact satellite link configuration will depend on the ATV signal requirements with respect to carrier-to-noise ratio, pre and deemphasis network and i-f filters. The emphasis networks, i-f filters and modulation index for ATV channels most likely will be different from

III. TECHNICAL STANDARDS

A. Interoperability With Alternative Media

It is evident that delivery of ATV signals over feeder and distribution parts of the television system will be carried out over a number of possible media, including terrestrial broadcast, satellite, co-axial cable, fiber optic cable, microwave, and pre-recorded media (e.g., VCR or video disc).^{5/} As indicated in the TD and FNOI at ¶¶ 127-134, these various media are likely to use different signal formats due to different tradeoffs between bandwidth, power, picture quality and channel capacity. It is in the public interest to allow each medium to deliver the highest possible quality of video service to the consumer and to be limited only by technical and business considerations unique to that medium. This can be accomplished through assuring interoperability among all distribution media.

Interoperability can be enhanced by the use by different media of ATV formats that employ compatible coding techniques. Among other things, this would make ATV more economical by permitting high level integration in receivers. However, interoperability can best be achieved through establishment by the industry of common display standards for ATV receivers and production standards for ATV program

those required for NTSC channels.

^{5/} See Final Report of the ATV Advisory Committee, Planning Subcommittee, Working Party 4 dealing with "Alternative Media Technology and Broadcast Interface."

material as well as standards for appropriate baseband interfaces in NTSC receivers for ATV inputs.

1. Receiver Display and Program Production Standards

The ATV receiver is one of the most important components of the total ATV system. One of the most critical parts of this receiver is the display subsystem. All transmission signal formats must interface with the receiver display signal format. Thus, the display signal format should be one of the first ATV standards selected.^{6/} The display standard should be of sufficiently high quality so that all media can use the same display format without loss of quality.

The ATV receiver should be capable of displaying the HDTV production signal format (such as 1125/60, 1050/59.94), or if a single HDTV production format cannot be agreed to by industry, then the receiver should be capable of displaying multiple display formats, including wide aspect ratio and stereo compact disc quality audio. Since the display is one of the most costly parts of the ATV receiver, the consumer should not be required to replace the complete receiver to obtain HDTV signals from different media. Also, providing the consumer with a full HDTV capability (measured resolutions of 700 to 800 lines) will allow receivers to be

^{6/} Currently, a number of display formats are being considered: 1050/59.94/29.97, 1125/60/30, 1050/59.94/59.94, 525/59.94/59.94, and 787.5/59.94/59.94. (No. of lines per frame/no. of fields per second/no. of frames per second.)

compatible with viewing signals delivered by various media, some of which may be capable of delivering near HDTV production quality signals.

The production signal format most likely will be the same as the display signal format. However, it is not mandatory that this be the case. It is important to select a production signal standard because the transmission signal format is derived from this signal and the quality targets as well as the signal processing employed for the transmission signal are determined by the production signal selected. While conversion from one signal format to another is possible, degradation of signal quality can result.

Once receiver signal display and production standards are set, and interface standards, discussed below, are established, the marketplace will be able to efficiently develop interoperable de facto standards that suit the particular requirements of each of the different transmission media.

2. Receiver Interface Standards

Beyond development of display and production standards, interoperability will depend upon development of common receiver interface standards. Such standards are critical to the efficient development of ATV standards for different media and the economical delivery of ATV to consumers from diverse sources.

As an absolute minimum, receivers should contain a baseband component signal interface as discussed in the TD

and FNOI at ¶ 130. This interface should be based on the Y/C, color difference or RGB component signals, with scanning method, field and frame rates, aspect ratio and synchronization method identified. A baseband interface at least would permit use of the same receivers for both NTSC and ATV. The drawback of this approach is that it would not provide much flexibility for use of alternative ATV delivery inputs.

An "open architecture" receiver standard, such as discussed in the TD and FNOI at ¶ 131, is an alternative approach offering complete flexibility and the capability of accommodating any media signal format by providing plug in interface modules. This type of receiver is desirable if the production costs can be sufficiently low and customer confusion can be minimized.

The above two approaches represent the extremes of either full flexibility or minimal access without flexibility. In a regulatory environment that fosters ATV, the marketplace may also permit development of ATV receiver design(s) in which different receiver models are offered (similar to a "cable ready" NTSC receiver, or more recently integrated VCR and NTSC receiver models). These different models may incorporate NTSC decoding, plus decoding of ATV signal formats for one or more media, such as terrestrial broadcast, satellite and/or co-axial cable. A basic ATV receiver design could be developed with sufficient provisions to offer this design as different models by adding

the appropriate signal decoding circuitry for each model at the factory.

3. Role of the FCC

HCI suggests that the Commission promote flexible receiver design through focusing attention on receiver signal display, program production and receiver interface issues and establishing appropriate guidelines. Following adoption by the Commission of general guidelines, specific standards will properly be set by industry standards groups and the marketplace. This will greatly facilitate the growth of alternative media and thus ultimately will lead to the supply by the marketplace of receivers that will appropriately ensure interoperability and the widest availability of ATV.

B. Transmission Standards

At ¶ 122 of the TD and FNOI, the Commission raises a number of questions with regard to ATV standards. The Commission should play a leadership role in developing ATV standards by establishing guidelines for the basic parameters discussed above such as frequency, bandwidth, signal format (two signal versus single signal, compatible versus simulcast) and receiver standards. Industry consensus and recommendations then should guide the determination of the specific transmission standards for particular media.

Rather than delay the initiation of ATV service until a clear consensus is reached on a terrestrial broadcast transmission standard, the Commission should continue to follow the approach taken in the TD and FNOI of narrowing

options and setting guidelines for a terrestrial broadcast ATV transmission. This will permit the efficient evolution of de facto standards that reflect true market requirements.

The Commission also should explicitly recognize that different transmission standards may be appropriate for different media. Although this proceeding focuses on terrestrial broadcast issues, resolution of some of these issues will have implications for the development of standards for other media. The Commission should avoid establishing any transmission standards for terrestrial ATV broadcasting that unnecessarily limit the development of ATV distribution over other media and should affirmatively promote flexibility so that appropriate standards can be set for each medium.

IV. CONCLUSION

For the reasons stated, HCI urges the Commission to affirm its tentative conclusions regarding the allocation of frequencies to terrestrial ATV and to adopt guidelines for bandwidth and channelization for terrestrial ATV that will facilitate prompt development by the industry of transmission standards for terrestrial ATV. Additionally, the Commission should establish guidelines for receiver display, production and interface standards which promote interoperability among alternative ATV delivery media and permit industry development of appropriate transmission standards for each medium.

Respectfully submitted,

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